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ABSTRACT

This handbook provides evaluation guidelines, information on acquiring courseware, and evaluations and recommendations regarding available instructional computer software appropriate to the needs of adult learners enrolled in adult basic education or General Education Development. Section 1 addresses computer hardware problems and limitations, copyright laws, and coping with hardware-related problems. In the next section, guiding principles in determining the appropriateness of educational courseware are considered. Guidelines are suggested for evaluation of software on the basis of its instructional strategy: tutorial, drill and practice, gaming, and simulation. A brief glossary of computer terminology is provided. Section 3 discusses potential sources for acquiring software: local development, program conversion, public domain software, and commercially produced software. A brief statement is offered about commercially produced authoring systems. Section 4 is an educational courseware survey. Information on approximately 45 producers, listed alphabetically, includes mailing address, computer type, a brief description of the producer and available programs, and evaluators' comments. Section 5 is a listing of courseware for adult education programing selected by two consultants to the project from the courseware evaluated in section 4. Appendixes include annotated listings of courseware catalogs/directories, magazines/journals/newsletters, and resource centers. (YLB)

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ED228457

HANDBOOK

for

THE IDENTIFICATION AND ASSESSMENT OF COMPUTER COURSEWARE

for the

ADULT LEARNER

COMPILED BY

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PROJECT DIRECTOR

DEVELOPED BY

THE SHENANDOAH VALLEY SCHOOL DISTRICT

AS PART OF A GRANT FROM

THE PENNSYLVANIA DEPARTMENT OF EDUCATION
DIVISION OF ADULT EDUCATION AND TRAINING PROGRAMS

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A special thanks is extended to Edward Chowanes who coordinated activities related to staff evaluation of computer software.

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SPECIAL RECOGNITION

Consultants for this project were eminently qualified to offer assistance and guidance in identifying and assessing courseware appropriate to the needs of adult learners.

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Joy Segall has published a prolific number of educational software reviews in various journals. As an experienced instructor in adult remedial educational programs, he combines a particular insight to the appropriateness of computer courseware in addressing the needs of adult learners.

PREFACE

The limitations of any project which proposes to offer an evaluation of instructional materials must always be foremost in the minds of the reader. The specific goal of this project was to identify and assess the availability and appropriateness of instructional computer software in terms of the needs of adult learners enrolled in Adult Basic Education (ABE) or General Education Development (GED).

Hopefully, the information contained within this handbook will be of particular value to the reader, but it should not be interpreted that the programs recommended are the only programs or necessarily the best programs available to address a specific instructional task. Currently, there are thousands of computer programs available on the market; over 150 private producers of educational software are daily adding to this collection. A thorough evaluation of all programs is simply not economically feasible. The demand for quality computer courseware has increased rapidly over the last several years. Many indicators suggest that this trend will continue. With an expanding market demand, many producers of traditional educational materials will enter this field; also educators, themselves, have become involved in designing and developing computer courseware either independently or in conjunction with major producers. There is every reason to assume that the quality of program design tomorrow will surpass what is available today.

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COMPUTER HARDWARE

Perhaps more than any other medium, computer assisted instruction (CAI) requires an understanding of the dependency between instructional program design and the technological elements of the machinery which will present that instructional program. In a more traditional medium, it is naturally assumed that all 16mm film will be compatible with all 16mm projectors. Computer Hardware (referring to the equipment itself, both mechanical and electronical devices) is not necessarily compatible with all computer software (referring to the programs, disks, and cassettes, and supporting documentation). Software which is directed at instructional programming is more specifically called courseware. Therefore, in establishing criteria for evaluating courseware, the limitations and advantages of the hardware must be considered.

Problems & Limitations

A common feature of most microcomputers (appliance computers) is their reliance on a programming language called BASIC. This is a compact program language with relatively few commands, thereby, making it an easy system to master by both instructor and learner. The drawback, however, is that BASIC is not universalized. Each company will have its own particular variation of BASIC. When you identify quality courseware, you must be sure that it will be compatible to your computer model. A program designed for TRS-80 will not run on Apple or PET. This problem has been alleviated to a degree. Catalogs are fairly clear in describing which programs are operative on specific models. One significant development has been the tendency of major software producers to design their programs to run on several different models.

Note - The Apple computer has turned to APPLESOFT in place of Interger BASIC; this may discourage producers, who need to adapt BASIC to run on several different models, from designing programs to operate on two fairly distinct program languages.

Program design cannot exceed the memory capacity of any particular model. All microcomputers have two types of memory. ROM (Read Only Memory) refers to what is permanently stored in the computer's Central Processing Unit. The CPU can be considered the brains of the computer; it controls and coordinates all operations performed on the computer. But what provides an indication of the power of a computer is the RAM capacity. Random Access Memory determines the capability of a computer to store and process data in the CPU. Memory is stated in terms of bytes. The PET model 4016 has a 16K capacity, which means it can store 16,000 characters or bytes of information. This can roughly be translated into storing 8 typed pages of data. The Apple computer has a 32K or 48K memory. In evaluating courseware some relative standards must be considered. Obviously, a program designed for a 48K memory will be better able to utilize or capitalize on the technical capacity of computers. Most instructional programs are designed for 16K memory. While this may be adequate in presenting drill and practice activities, it is difficult to program tutorial programs which feature instructional branching without an expanded memory.

Programs are fed into the computer, generally, by either a disk or cassette interface. A cassette interface will use a simple audio cassette recorder which is relatively inexpensive. A disk interface will necessitate a disk drive system; this adds considerable cost to any computer system. However, with a disk drive system loading time is reduced from

minutes to seconds. In terms of software design, the floppy disk (resembling a 45 rpm record) allows random access to any part of the program. A cassette tape must follow a program in sequence. A far greater flexibility in menu selection is possible with the disk drive. The trend in program development is towards disk drive, although many producers will design and manufacture their programs to operate on both disk and cassette tape. You can probably expect more problems associated with malfunction when using cassette programs.

Finally, while this may not seem to be a problem, the fact that it is easy to make illegal duplications of commercial courseware will pose some complications. Commercial software is protected by copyright laws. Under the "fair use" clause, it is permitted to make a back-up copy to use in the event that the original program is damaged. However, reproducing an unlimited number of cassette tapes or floppy disks and distributing them to other agencies presents a real property loss to the manufacturer. To safeguard their investment, producers are cautious in allowing agencies to preview their products, and increasingly more programs are being coded to prevent even legal "fair use" duplication.

Major developers of educational products were slow to enter the computer courseware market. A small cottage industry filled this vacuum. While early producers had command of technical design, they often failed to appreciate instructional content. The vast majority of programs are not educationally sound.

Programs which are "protected" have two significant disadvantages. Primarily, program failure due to normal wear, abuse, misuse, or electrical and mechanical problems will result in an economic loss to districts without a legal duplicate to replace the damaged program. Also, there may be a critical disruption in the educational program while waiting for

a second copy to be sent to the district. Cassette tapes, and to a lesser degree disks, are vulnerable. Secondly, one of the most potential pluses associated with CAI is the ability of educators, with training and experience, to modify and adapt programs to meet their specific needs. More than any other medium, computer courseware allows manipulation; the instructor has the opportunity to rephrase questions, alter feedback, and control responses. These features are prevented with "protected" programs. Unfortunately, but perhaps understandably, many of the programs being developed for the Apple are coming on "protected" disks.

Coping with Hardware Related Problems

Ideally, you would not select the computer first, but find the type of programs you believe offered your educational program the greatest advantage and then purchase the computer model which can run those programs. In practical experience, this rarely occurs. Finding quality software to match the requirements of your hardware, however, is possible. More than word-of-mouth or recommendations from hardware vendors, educators should rely on courseware evaluations which are offered in professional microcomputer journals (see Appendix B). Catalogs and directories, which generally fail to critically assess courseware, will provide information related to return and prior review policies (see Appendix A). Most software vendors will allow a brief trial period. Therefore, it is extremely important to establish a routine of immediately evaluating programs as they arrive. Agencies should be cautious in placing large orders which may prevent a complete assessment of all the materials within the permitted time allotted by the distributor.

EVALUATING COURSEWARE

The guiding principles in determining the appropriateness of educational courseware centers on two general questions. Does the program design capitalize on the unique features of the hardware; and is the instructional content, along with the program design, relevant for the target population.

Perhaps more effectively and efficiently than any other medium, the computer can provide immediate feedback to the learner. The computer can engage the learner in a dynamic interaction based on this capacity for responsiveness. Quality courseware will encourage active, rather than passive, learning. Flexibility should be designed into the program to allow both instructor and learner an opportunity to alter certain facets of the program to meet specific needs and interests. Programming should be designed to permit the learner to control the pace of instruction. Graphics (animations), color, and sound may be used to enhance the learner's interest and motivation, in addition to highlighting educational content.

Regardless of the technical design, the validity of courseware is rooted in the soundness of the instructional content, scope, and sequence. Courseware should provide sufficient documentation to assist the instructor to determine the proposed educational objectives of the program. Performance objectives should be clear. While content is directed at a particular grade level function, in remedial programming, interest level should consider the psychological and emotional needs of the learners.

Based on the manner in which educational courseware is designed and formatted, four instructional strategies can be categorized: tutorial, drill and practice, gaming, and simulation. Software should be evaluated within the context of the intended instructional strategy. The appropriateness of courseware should correspond to the educational rationale for utilizing computer assisted instruction. If the educational objective is to provide a teacher-directed program, using the computer to reinforce concepts, then courseware appropriateness would be assessed in terms of adequately providing drill and practice. Simulations and gaming programs would be adequate if the intent is to provide enrichment activities and indirect learning strategies. Tutorials programs are designed to present the learner with new or additional information in mastering a concept or principle.

Tutorial

The objective of any tutorial is to provide additional information to assist the learner understand a new concept or clarify a previously exposed idea. Interaction between the learner and computer is the key element in distinguishing poor and excellent program designs. Tutorials will alternate between text materials and questions designed to assess comprehension. When a student fails to respond adequately to a series of questions, tutorials will generally either repeat the text material or present additional information. This capacity to present additional information or utilize a different approach to demonstrate a concept requires branching. Programs designed for computers with a limited memory (16K) will be restricted in this function; therefore, they will be hindered in presenting tutorials. While branching is desirable, the capability to retreat is essential. The learner should be able to refer to a specific passage in the text if he/she has difficulties in solving some of the questions. Some programs will do

this automatically if the student makes one or several incorrect responses. However, students should be able to review passages or principles in the text without necessarily making an error. The addition of graphics, sound, and color should be included only to the degree that it reinforces instruction. The main consideration should be the clarity by which the text material is formatted on the display screen. Animations may distract the learner. Ideally, some flexibility should be provided to the instructor or learner in controlling the amount of information or length of instruction time. Personalization and reinforcement may be extraneous. By design and content considerations, these are the most difficult programs to develop. Yet, tutorials are capable of providing individual assistance and attention to learners based on their particular needs. A tremendous advantage to tutorials is the pacing of instruction to correspond to the learner's capacity to absorb information.

Drill & Practice

It is relatively easy to design good drill and practice programs. Computers with limited memory (PET 16K) are perfectly adequate in presenting these programs. These programs are not intended to introduce new information, but reinforce previously exposed concepts. Unless in a testing mode, feedback should be immediate. More than simply informing the learner of correct and incorrect responses, feedback should be directed at assisting the learner in understanding the nature of the error. Some programs will even explain why answers were correct. Good drill and practice should be highly interactive, not merely a listing of ten questions to which the number of correct responses is identified to the learner at the completion of the exercise. Some programs will provide to the instructor and learner an analysis of errors. A criticism of these exercises by educators is

that they simply reinforce a stimulus/response disposition. Nevertheless, reinforcement is an essential element in learning. Drill and practice programs should be highly flexible allowing the instructor the capability to determine an appropriate difficulty level and number of programs which corresponds most adequately with the learner's needs. Programs which randomize questions will have the advantage of extending practice at a particular topic area without resorting to additional programs. Graphics and reinforcement are usually included to stimulate motivation. but should always be appropriate for the target population.

Simulations

Through this instructional strategy, the learner can experience how variables may affect intended or predicted outcomes. Simulations attempt to duplicate a simplification of a real-life situation, such as fighting a forest fire, dealing with nuclear meltdown, or examining the food-chain cycle in a lake. The learner becomes involved in a decision-making process based on cause/effect relationships. Graphics, well designed and highly detailed, may be essential in presenting some simulations. Program design should actively involve the learner in decision-making and experimentation, not simply demonstrating an event or process.

Gaming

The computer can provide games for entertainment or as a motivation for reinforcing some instructional concept. Some arcade type games may help young elementary students develop better eye/hand coordination. However, game formats should address some academic need if they are intended for use in an educational setting. The over-riding criteria for evaluating games should be their relationship to an instructional objective. A problem

which can often occur in gaming is an inconsistency between the designed animation and instructional content. Some graphics and gaming formats seem directed at motivating and stimulating early elementary students, but the educational material being covered in that program is designed for older students. This is, of course, the exact opposite of what should be desired for remedial students. Also, a limited sequence of graphics may be constantly repeated. For example, one program uses a tennis game format to assess a student's ability to understand prefixes. Everytime the learner correctly spells a base word with the correct prefix, an animated figure hits the ball over the net and scores a point. Unfortunately, this same series of graphics is continually repeated without variation. The program soon becomes boring for the learner. Educators should be sensitive to an over-emphasis on gaming programs. Computer Assisted Instruction is too costly in terms of human and financial resources to become associated as a toy item to the learner.

Terminology Associated With Courseware Evaluation

New technology inevitably results in a new vocabulary. Essential in understanding and communicating aspects of program evaluation is a grasp of the language which has developed through this medium.

Cursor/Clue/Promptor -- This is generally represented by a flashing symbol, such as an arrow or square. It is intended to focus the learner's attention to a specific spot on the video screen or to a particular operation being presented. While used in most courseware, they are particularly valuable in assisting students through mathematical operations.

Branching -- One of the most celebrated features of CAI is the capacity to branch. Based on the learner's response the program will vary difficulty level, number of problems, or refer the learner to additional information to solve a problem. However, it usually requires computers with advanced memory (Apple 48K) to adequately design good branching programs. Conditional branching is based on a test of some condition; unconditional branching is not necessarily based on a specific learner's response.

"Debugging" -- Simply, it refers to removing errors from the computer program. Errors can occur in the video format or technical design. As a whole, we have observed more spelling and grammarical errors in program courseware than any on the instruction medium. Technical errors will obstruct the loading or flow of programs. Certain unanticipated responses by the instructor or learner on the keyboard may trigger an error. For this reason, many companies will field test their courseware, specifically, to identify technical errors.

In developing your own software from scratch, making program conversions, or using authority systems, technical and format errors need to be controlled. Errors are more prevalent in public domain materials than privately produced software. Generally, with limited training in programming, many of these minor errors can be corrected. Educators developing CAI need to acquire some experience in programming.

Documentation -- Producers will often include a written description of what their software is supposed to do. Beware, this may not always be accurate. Some courseware will include: performance objectives, management guides, supplemental materials and suggestions of how to effectively integrate courseware into the regular curriculum.

Feedback/responsiveness -- The unique feature of CAI is the capacity to provide immediate feedback to the learner's inputs. More than simply indicating which responses are correct or incorrect, feedback can include a step-by-step guide to assist the learner in correcting and understanding the nature of the error. Follow-through is another term used to indicate a program's ability to clarify to a learner why an answer was wrong or why the answer was the correct response.

Fixed Format -- Programs with a fixed format offer no menu selection to the instructor or learner, and they will not branch, or alter program flow, as a result of the learner's responses. They provide no choices. Programs with a fixed format fail to capitalize on the unique features of the computer.

Flexibility -- The flexibility of a program design increases as the number of choices available to the instructor and learner increases, such as determining the number of problems, selecting an appropriate difficulty level, and having available a series of topics or stories which can be utilized. By design, disks will allow greater flexibility than cassettes. Branching programs will often automatically alter the flow of the program based on the learner's responses. Generally, the more capable a program is to be flexible, the more likely it will be that the practicular needs and interests of the learner can be met by that program.

Graphics -- The use of animations to embellish instructional content is certainly a significant advantage of this medium. Graphics, color, and sound should always be considered in terms of their contribution to the educational objectives. There is general disagreement between educators as to the actual effectiveness of these devices. While elementary students respond quite positively to animations, they may distract or even embarrass the adult learner.

Kid Proofing -- This is a necessary condition for all educational software. Simply, the learner is unable to break the flow of the program by unintentionally hitting a wrong key. Most commerically produced software will be "kidproofed." It may be more of a problem in teacher-designed programs, public-domain material, or in authoring systems.

Linear Programs -- Most programs for 16K memory will be linear rather than branching. Linear programs can only follow one line through the program; but based on the learner's responses, they may repeat certain sections of the program (reading passages or math principles) in order to assist the student solve a particular problem.

Menu -- At the beginning of a program, a list of choices may be presented to the instructor or learner which enables certain aspects of the program to be set by the user, such as difficulty level, number of problems or questions, or selection of particular subject topics or stories. The menu is an indication of the program's flexibility.

Personalization -- Programs may ask the learner to type-in their name. Management systems will usually require it. Positive reinforcement or test results will refer to the learner by name. Elementary students are usually impressed by personalization: this feature may be extraneous for the adult learner.

Randomizing -- This refers to the computer's ability to randomly select various questions or problems. For example, a math program may request a learner to respond to: No. 1 (4 + 7 = ?); No. 2 (8 + 3 = ?); and, No. 3 (7 + 10 = ?). If the learner requires additional drill and practice at this level, the second time the learner is working on this program the questions will be altered: No. 1 (5 + 6 = ?); No. 2 (9 + 2 = ?); and, No. 3 (13 + 4 = ?). Random selection can be designed into language arts programs and other subject areas.

Reinforcement (positive and negative) -- Most programs will employ a series of comments designed to motivate student achievement. A general complaint is that some producers will over-do positive reinforcement. Remarks such as GREAT! GREAT! SUPER JOB! JOE, we knew you could do it!, may be distracting for even elementary students. The adult learner's motivation must be intrinsic. Excessive positive reinforcement may have a reversed affect on the learner's motivation.

Retreating/Retrenching -- This is an excellent feature in reading programs. It allows a specific passage to be repeated to the learner in order that a particular question or concept may be clarified. This does not provide information which can be the case in branching programs.

ACQUIRING COURSEWARE

There are four potential sources available when acquiring courseware for CAI. In addition to commercially produced software, agencies can consider developing their own programs, making program conversions from privately produced courseware in printed form, and seeking-out public domain courseware.

Developing Your Own Programs

> Courseware writing and instructional design are creative activities involving both technical programming skills and the ability to compose, organize, and display educational content in an effective and interesting manner. The skills and interests that generate effective courseware design are different than those that go along with being an effective classroom teacher (Joiner, 1982).

We personally believe that teachers should be involved in program design; nevertheless, Lee Joiner makes a good point. Courseware development requires expertise in two fields. In addition to the problems that individual agencies and school districts will face in trying to encourage local talent to become involved in courseware design, it is costly in terms of financial resources and time in developing software. Estimation may range from $100 to $400 to produce ten minutes of original courseware (Joiner, 1982). Considering that many quality commercially produced programs cost less than $25, the impetus to design your courseware should be based on the need to develop software to specifically address a defined instructional deficiency not adequately covered by commercial producers. Forming a consortium with neighboring schools is a practical means of combining resources and local talent to efficiently and effectively produce original courseware. This has been successfully realized in Minnesota and Michigan. A requirement in building a consortium is that all members

agree and have access to similar hardware. In Minnesota, the Department of Education provided direction in encouraging the aquisition of the Apple computer. Many states do not wish to become involved in favoring one commercial product over another. As educational agencies make independent judgements on hardware, it becomes increasingly difficult to form consortia. Also, the size of a consortium will affect productivity. Small consortia may lack sufficient resources to realize its objectives. However, large consortia may experience problems in reaching agreement on specifically defined instructional deficiencies. Different schools, serving different clients, will likely have different instructional needs. If public funds are used in producing courseware, the materials belong to the public domain and cannot be sold for profit.

Program Conversion

Several commercial producers will publish programs in printed form, generally available in a magazine or journal, such as Creative Computing (see Appendix B). Over 60 programs are printed by David Ahl in "More Basic Computer Games" published by Creative Computing Press. Considering the cost of the book, the cost per program is about 25 cents. Schools which provide for the conversion of printed programs to tapes and disks as an enrichment activity for gifted students will have a valuable source for acquiring programs. Many of the programs in printed form are game formats, but some could be integrated into sound instructional programs. This is a time consuming process, and it is a difficult task. Released time for teachers to perform this task does not seem to be a realistic allocation of this human resource.

While printed programs are covered by copyright restrictions, districts and agencies are permitted to make an unlimited number of duplicate copies of the produced cassette tape or disk version for their own internal use.

Public Domain Software

Computer courseware developed with public funds--as a result of federal/state grants--belongs to the public domain. Software, so classified, cannot be sold for profit; copyright restrictions do not apply to these materials. The problem, of course, is to identify agencies which have produced courseware with public funds.

Perhaps the most significant collection of public domain educational software can be located in the Microcomputer Center, Redwood City, California; a project referred to as SOFTSWAP maintains a library of over 200 programs. These programs are edited and evaluated by a team of educators who are experienced in CAI; and they are suitable for the Apple II, TRS-80, PET, Atari, and Compucolor microcomputer.

Visitors to the SOFTSWAP library are permitted to make free copies of any public domain materials or programs which have been donated to the center by educators. School districts and other agencies are asked to donate locally developed materials to the center. These programs can be secured through direct mail-order. There is only a modest cost to cover the personnel time and materials in producing duplicate copies. It may, also, be possible to find microcomputer vendors who will provide public domain materials free of charge as an inducement for your business or at the cost of duplicating these programs (see Appendix C - SOFTSWAP).

Evanuation-Public Domain Materials

We had the opportunity to review approximately 130 programs from SOFTSWAP. A local computer vendor made them available to our district for a cost of $50, presumably to cover duplication. This represents an incredibly low cost of less than 50 cents for each program.

The programs were stored on five disks, Each disk related to a general subject area. Disk No. 1, language arts; Disk No. 2, mathematics; Disk No. 3, science and social studies; and Disk No. 4 and No. 5, math literacy (The particular programs we received, and the arrangement of programs on each disk may vary depending on who is distributing SOPTSWAP materials).

The first problem that we experienced is that the programs were loosely arranged. Under language arts, for example, one program might assess a learner's ability to use "A" or "An"; the following program could deal with French verbs. Also, the grade level, in terms of content, would vary significantly between programs on any particular disk. On Disk No.2, a program offering drill on basic addition was followed by a program demonstrating how to calculate morgage rates. A fair amount of work is required in regrouping programs into sets which are conveniently arranged for instructional purposes.

More serious is the lack of documentation. Teachers are not provided with any information which outlines educational or performance objectives. We have had problems trying to determine the proper audience for several programs. On Disk No. 1, Hangman II uses a game format which is appropriate for early elementary students; yet, the vocabulary words seem more appropriate for high school students, for example, Akimbo.

In general the directions for student use were poor and sometimes entirely excluded.

We had more problems in loading and operating programs than we encountered with commercially produced software. Disks No. 4 and No. 5 presented many problems. Many of the sentences in these programs began with a lower case letter followed by upper case letters. Apart from correct punctuation, these sentences were visually difficult to read.

The overall quality of these programs would range from poor to fair, but several were well designed.

Acquiring 130 programs lacking documentation, program descriptions, is a bit like buying a grab-bag at a carnival. Although the cost for these programs was minor, it would be difficult to justify this type of procurement unless:

- sufficient staff time was available to evaluate and classify programs based on specific educational objectives; and,
- the school district or institution had a broad range of possible application for computer software, such as, in remedial and gifted progrmas at both the elementary and secondary level.

Commercially Produced Courseware

Initially, most of the large corporate-type producers of educational materials were reluctant to become involved in publishing computer software: SRA, Borg-Warner, Random House, Holt, and Milliken. This void was rapidly filled by nearly 150 independent producers, but the educational quality of software will vary significantly depending on the producer. The most frequent complaint from educators has been the difficulty in locating sound instructional programs. Currently, about two dozen independent producers and a handful of major corporate publishers are establishing a clear reputation for their ability to design, in terms of content and technical features, quality programs. In terms of quantity, probably more educational programs are available for the PET computer, followed by the TRS-80 and Apple. However, the most sophisticated programs seem to be designed for the Apple. Generally, the corporate producers seem to be designing their programs only for the Apple. Some attention is being given in producing programs for the Atari and VIC-20. A favorable trend is the fact that most producers seem to be interested in designing various versions of their programs in order to be compatible to several different computer models. Also, it is anticipated that shortly some computer companies will design hardware which will enable programs specifically designed to operate on other computer models to be automatically converted to their particular model. Nevertheless, as will be obvious from our survey, in terms of courseware appropriate for adult learners, the most suitable computer is the Apple. Fortunately, many of the programs designed for the Apple will have versions for the TRS-80 and PET.

The following survey may be biased against the corporate-type producers. Often, the cost of their software made it difficult to acquire programs to evaluate for this project. Also, the majority of the reviews which we

examined in journals dealt with the programs designed by independent producers. Small producers will depend on independent distributors to advertise and promote their programs. These distributors are generally not permitted to market the programs developed by the major corporate producers of educational materials. In conducting our survey, we have often requested information from distributors as to the products which they felt represented some of the best programs on the market. Without having access to the major corporate designed programs, they were disadvantaged in providing relevant information about their products.

Microcomputers in Education is associated with Queue. As an independent distributor of software, Queue was one of the first to appear on the scene. Their collection of software is also one of the most extensive offered by any distributor. In Microcomputers in Education, they have rated courseware in terms of sales and comments from educators. These evaluations for 1981 and 1982 have been included in the Educational Courseware Survey which follows. We have found their appraisals of courseware to be fairly consistent with our own assessment; still, it should not necessarily be interpreted that if MIE rates a producer No. 1 in both 1981 and 1982, it is the best producer of courseware in the country. Their assessment, again, reflects their view based on the sales from Queue, and their interpretation of various comments from educators and reviews appearing in other journals. Major corporate-type producers were not considered by MIE in their rankings of producers.

Preceeding the Educational Courseware Survey, a brief statement will be offered about commercially produced "authoring systems".

Authoring Systems

Some programs, commercially produced, are designed to allow educators with little or no training in programming the ability to create their own instructional content. Quick Quiz ($35) by Micro Lab Learning and Study Made Easy ($15) by Creative Computing are examples of the most basic designed authoring systems. They permit the teacher to type in their own quizzes. The instructor can write a series of questions and assess the learners understanding through four multiple choice answers. This type of basic design does not allow for teachers to add graphics or positive reinforcement. Q & A ($7) by Teacher's Pet will allow more flexibility. Fill-in and sequencing can be used in addition to multiple choice. Also, the teacher can include graphics as positive reinforcement for correct responses.

There are, however, some very advanced designed "authoring systems." Micro Lab Learning has also produced Learning System for the Apple ($150). This program allows the instructor to include a text and question section. The text section creates tremendous possibilities: an interesting story, designed to assess comprehension; basic rules, related to punctuation; or, mathematical formulas can be programmed. In the tutorial mode, if the student makes an error on a test question the computer will automatically refer the student to the specific section in the text which relates to that problem. In the exam mode, re-entry to the text will not occur. With this particular system, test design can include fill-in, column matching, and multiple choice. In addition to immediate scoring of tests, an analysis of errors, averages, and question validity is provided. Unfortunately, this program requires a 48K Apple with two disk-drivers. Avant-Garde developed a program called The Creativity Tool Box ($125). While not specifically designed for any one function, it allows a teacher a great deal of flexibility in program design. Music, poetry, short stories, animations, and

various testing formats can be created. This program is also designed for the Apple but requires only one disk-drive. Most producers will offer several types of authoring systems ranging from simple designs to more complex and flexible programs. Speed Reading Comprehension by Abbott Educational Software is designed for the PET and will be referred to in the Courseware Producers' section.

Through "authoring systems" educators have the opportunity to design curriculum materials to specifically relate to the needs and interests of their students. The price for this distinct advantage, in addition to the cost of programs, is providing adequate time and practice for meaningful curriculum development. If possible, this is an investment which should be made.

EDUCATIONAL COURSEWARE SURVEY

The programs we sought to include in this survey were the frequently cited series which were identified by educators, distributors, and professional journals and magazines.
Our effort to be as inclusive as possible had to be balanced by the restraints of time and finances. Nevertheless, it is our hope that the survey has listed many of the popular and educational sound programs which are available on the market.

Generally, our sample of a particular producer was simply too small to warrant a definite opinion on their overall craftmenship. As a general guide, this survey should assist educators in identifying appropriate courseware. But, educators would do themselves a disservice by interpreting our work dogmatically. Again, appropriateness was determined in terms of our criteria of what should be effective with remedial adult learners. We perferred program formats which offered, at least, some tutorial instruction. Gaming and simulation formats were not prioritized. Excessive graphics and reinforcement, positive or negative, were considered extraneous for the adult learner.

Catalogs will provide more accurate information related to costs and specific hardware requirements for various programs. If we were not sure of a mailing address for a particular producer, we provided the address of Queue: a distributor from who those programs can be obtained. However, other distributors listed in Appendix A may also have access to those programs.

Abbott Educational Software
334 Westwood Avenue
East Longmeadow, MA 01028

PET 16K
cassette

An authoring system developed by Abbott Educational Software is Computerized Speed Reading ($50). It allows the instructor, without any special training in programming, to type in any short story or passage which will be used to assess the learner's speed reading ability and comprehension.

Speed reading can be assessed through three different program formats:

Read A will present ten lines on the screen. While lines on the top will begin to be deleted, new lines will appear on the bottom.

Read B will present only one line. Words, starting on the left, will begin to be deleted until a new sentence replaces the deleted line.

Read C will present one line also; but at a given period of time, the entire sentence will be deleted.

Both the instructor and learner can control the rate by which these lines will be deleted. The program will provide an indication of student's speed reading rate. Comprehension can be assessed by a series of instructor designed questions. Once a story is programmed, the instructor can make modifications and duplications.

Comments: The value of this program would relate to the significance you would attach to speed reading. Most of our staff did not feel that assessing speed reading provided much assistance to remedial learners. They felt that programming was time consuming and difficult. Editing presented problems. Of the three formats, they preferred Read B. However, the advantage to the program is the ability to type passages which can match the learners interest and reading level. At a cost of $50 the program is not excessive. Unfortunately, it seems that it is only available for the PET cassette-drive.

Advant-Garde
Box 30160
Eugene, OR 97403

Apple, PET, TRS-80
disk, cassette

Several programs from Advant-Garde have been receiving favorable reviews. Creative Computing (October, 1981) was impressive with Sentence Diagramming ($20). Other noted programs are Poetry ($30) and Phrases and Clauses ($30).

Comments: Their programs appear more appropriate for advanced students. Some comments we have read indicated that the programs were difficult which could pose some problems in a remedial instructional program.

Borg Warner
600 West University Drive
Arlington Heights, IL 60004

Apple

Borg Warner (System 80) has recently entered into computer courseware development. Programs which they have designed deal with college entrance examination preparation, sentence structure, and critical reading. Each series consists of approximately eight disks and costs about $750; however, Borg Warner has a leasing policy to schools. Programs can be rented for $180 annually. Robert Jackson, writing in MIE (October, 1981) referred to these series as representing some of the best quality courseware available on the market. A representative from Borg Warner will demonstrate these programs in your school district. Each system has a comprehensive student management system. Documentation is excellent. By design (graphics and reinforcement) and content these series are directed to the high school student.

Comments: We have evaluated Critical Reading. Regardless of any other consideration, this program is simply not directed or relevant for remedial instruction. In one exercise students are presented with a series of questions related to usage of the terms "or" and "all" in order to develop skills for making valid inferences. One question asks:

> Fred or Mollie saw a robin. Fed did not see a robin. Joan or Mike saw a bluebird. Mike did not see a bluebird.

True or False -- Joan did not see a bluebird.

Another question related to identifying incomplete statements asks:

> If Miguel is elected president of a club, then Maria will be happy. If Fran is elected secretary, then Dick will be unhappy. Miguel was elected president of the club. Dick was unhappy.

True or False -- Maria was unhappy.

We find it difficult to imagine that these types of passages would motivate remedial learners, particularly adults, to want to read. Adults should be exposed to materials that are personally meaningful and relevant.

Brain Box or Brain Bank
601 West 26th St.
New York, NY 10001

Apple, PET, TRS-80

Description: Brain Box, who recently changed their name to Brain Bank has one of the best reputations in courseware development. They were rated by MIE in the top 10 for 1981 and are rated No. 2 in 1982. They have concentrated on reading, language arts, and science. In MIE (February, 1982) one teacher commented that he believed Brain Box provided the best reading programs for the PET Computer. Some of their programs are Four Basic Reading Skills ($50 each), Word Elements Series ($80), The Human Body ($80), The Human Skeleton ($50), The Decade Game ($50), and Word Functions ($80).

Comments: Their programs are noted for excellent graphics and good documentation. A demonstration disk is available for $30, but this will be credited to a purchase provided you acquire more than two programs. Brain Box claims to employ a professional staff of educators and computer programmers.

The Human Body: An Overview (Parts 1 & 2)

Our staff considered this program to be excellent. The courseware consists of eight programs: Introduction to the Human Body, Muscular System, Digestive System, Respiratory System, Skeletal System, Circulatory System, and Review Test Program.

The program provides tutorial instruction, drill and practice, and simulations. Both graphics and sound are excellent. A 6th-grade reading level ability is necessary to use this series. Each program will require 20 to 30 minutes to complete the exercises. In addition to science, this program can be used to develop reading comprehension.

Word Elements - Series No. 1 (prefixes: sub, uni, bi, tri, semi, hemi, demi, inter, trans, and intra)

The learner works on changing the meaning of words through prefixes. Time-on-task requires 30 minutes. It may require a 5th-grade reading level and uses tutorial and drill and practice strategies. Feedback and graphics are good. The evaluation team considered both Word Element Programs to be good and educationally sound.

Word Elements - Series No. 3 (suffixes: meter and gram)

This program uses tutorial and drill and practice strategies to assist the student understand basic metric concepts. Graphics are excellent; instructional content is well designed. Program will require about 20 minutes to complete the exercise. Students should have a 6th-grade reading level. The only weak aspect of this program is the inability of the instructor to vary the difficulty level. No menu selection is available.

Brain Box (continued)

Four Basic Reading Skills - Unit 1/Introduction

This program is intended to instruct students in the four basic reading skills: recalling detail, main idea, drawing conclusions and sequencing. Reading level will require 3rd grade ability. Time-on-task is approximately 30 minutes. As with all Brain Box courseware, feedback and graphics are excellent. One problem cited by our staff is that the program will repeat many of the same stories for assessing or developing different reading skills, such as main idea or sequencing. Students might not be motivated to read the same story two or three times.

Basic Skills Series A to F (we evaluated programs A & F)

Each program will contain five different stories. Each reading passage is followed by at least five questions which are related to each of the basic reading skills: main idea, recalling detail, etc. Time-on-task requires about 20 minutes. A 3rd-grade reading level is required. Graphics and feedback are well done. Stories are entertaining and interesting.

American History: The Decades Game

In this game format for 1 to 4 players, students attempt to guess the decade in which certain historical events occurred. Exercises require 15-20 minutes to complete. The instructor or learner can set the difficulty level and number of questions. The program will generate randomized selection. Unlike other Brain Box programs, graphics are not used. It might be questioned how effectively history can be appreciated through an association of events and time. It does not lend itself to developing or understanding underlying events which shape history or developing reading comprehension.

Brain Bank has produced excellent courseware. The use of graphics for reinforcement are directed to motivate and entertain elementary students. The nature of the stories and the rich use of graphics makes their programs more suited for younger learners; however, the Basic Skills Series A to F and The Human Body may be appropriate in adult education.

Computations
Queue-5 Chapel Hill Drive
Fairfield, CT 06432

Early Elementary I ($125) is a series of 15 developmental activities covering pre-school to 2nd-grade language skills. While not intended for adults, an interesting feature of the program is that a special version was developed for handicapped learners.

Several authoring systems are available: Study Quiz Files ($24) allows quizzes to be designed with the short answer/long question format; and, Multiple Choice Files ($24) will allow teachers to develop testing programs with a randomized question format.

Comm* Data
Queue-5 Chapel Hill Drive
Fairfield, CT 06432

PET
cassette

They feature some simple drill & practice programs on Square Root, Roman Numerals and Area & Perimeter for about $8. Also, they have a K-1 six-cassette series dealing with alphabet shapes and numbers.

Conduit
Box 388
Iowa City, IA 52244

Apple, PET, TRS-80
cassette & disk

In MIE, Conduit has been rated as one of the top ten producers for both 1981 and 1982. They have a strong reputation for developing high school science programs, such as, Chemical Lab Simulation and Surface. One program which has received some excellent comments is Algebra Drill & Practice I ($125).

Comments: Algebra Drill & Practice requires the Apple 48K. It is designed for high school students. If a student misses a problem on a second try, the program will demonstrate the correct technique for solving the problem. Problems will randomize. Each lesson will run about 15 to 20 minutes. Topics include algebraic signs, operations with numeric and algebraic fractions, word problems and fractions. Several difficult levels are available in the menu and a step-by-step process is followed in demonstrating the correct technique for solving problems.

Designed as a drill and practice exercise, it is probably very appropriate for students currently enrolled in a high school algebra class, but may be too difficult for remedial adult learners.

Data Command
Box 548
Kankakee, IL 60901

Apple & TRS-80
disk or cassette

Rated by MIE as a top ten producer for 1982, it has an excellent reputation for designing educational programs into game formats. Some of their most popular language arts educational games include: PIK-PEK-PUT ($230)

Data Command (continued)

a version of Tic-Tak-Toe which offers drill on prefixes, homonyms, base words, and plurals; Tennis Anyone ($170) provides practice in prefixes, a correct response will send the ball over a net and score a point. Usage of singular and plural possessives is reinforced in Riddle Me This ($86); it is assumed that the desire to complete a riddle will provide the motivation to complete these exercises. In Alpine Skier ($114), correct responses related to distinguishing fact and opinion, cause and effect, and categorizing words and phrases will safely navigate an animated skier down a slope.

Each program will require about 15 to 20 minutes to complete the activity. A problem with this series is that the instructional design is directed to 7th-grade students, while graphics seem more appropriate for early elementary students. Tennis Anyone simply repeats the same animation sequence. It becomes boring. However, what disturbs us most about this program is that it probably provides a better spelling exercise than assisting students to understanding prefixes. Graphics and the riddle game format used in Riddle Me This also seem appropriate for younger students, while the content is designed for students in grades 7 to 10.

Alpine Skier does provide an interesting instructional content. The questions do relate to developing critical reading skills. While the animation will continually repeat the same sequence, it is more interesting than Tennis Anyone or Riddle Me This. Unfortunately, the graphics and game format are not consistent with the target population for which the content is designed. Considering the favorable comments we heard and read about these programs, we are disappointed with their quality.

Dr. Daley's Software
425 Grove Ave.
Berrien Springs, MI 49103

Apple & Pet
disk & cassette

Purser's Magazine has often referred to the high quality of their science programs. They developed a series for chemistry. The target population for their software seems to be the college-bound high school student.

Dorsett
Queue-5 Chapel Hill Drive
Fairfield, CT 06432

TRS-80 & Atari
cassette & disks

Dorsett has produced two reading comprehension series. An interesting series of cassettes deal with the Great Classics: Macbeth, Treasure Island, Ivanhoe, Grapes of Wrath, etc. They are one of the few producers who develop software for vocational programs, such as: carpentry, auto mechanics, and general shop practices. The general sciences are also well covered by Dorsett. They have received mixed reviews in some journals. Dorsett is one of a few producers currently designing courseware for Atari. The Great Classics Series can be purchased for $80. Their vocational programs cost about $20 each.

Dynacomp
6 Rippinggale Rd.
Pittsford, NY 14534

Atari, CP/M, Osborne
Apple, TRS-80

Dynacomp has established a good reputation for designing computer games, such as, Gin Rummy, Chess Master, Go Fish, and Poker Party.

They have produced several simulations which may be appropriate in an educational setting. Forest Fire requires the learner to consider various variables in decision making, such as, wind direction, managing resources, and determining what whould be protected. Monarch is another simulation which stimulates thinking.

Hodge-Podge ($24) is designed for preschool learners and is directed to developing letter and number recognition. It has received excellent comments in the Classroom Computer News.

Educational Activities
1937 Grand Ave.
Baldwin, NY 11510

extensive collection for:
Apple, TRS-80, Pet
disk & cassette

In both 1981 and 1982 Educational Activities has been rated No. 1 by MIE. Most of the positive technical features associated in CAI typify their courseware, including: personalization, graphics, immediate feedback, positive reinforcement, and excellent color. More importantly, their programs are generally educationally sound. Educational Activities has an excellent reputation in designing reading, math, and language arts programs. Some of their most popular programs are: How to Read in the Content Area, Our Weird & Wacky World-Literal Comprehension, Our Weird & Wacky World-Critical Reading, English Basics, Punctuation I/Punctuation II, Read & Solve Math Problems, Introduction to Mathematics in the Computer, Missing Math Facts, Introduction to Decimals on the Computer and Percentages.

How to Read in the Content Area ($50)

Consists of four programs, $50 each or all four for $189. Each program deals with a particular subject area: science, social studies, literature, and mathematics. Under each topic area several interesting stories are available on the menu. Basic reading skills will be assessed through a series of questions designed to determine the learner's ability to recall important facts, understand vocabulary, identify the main idea and make proper inferences. An incorrect student response will cause the program to retreat to the particular part of the story dealing with that question. Instructional strategies include both tutorial and drill lessons. Learners need to be able to read at the 5th-grade level in order to understand some of the vocabulary. Each lesson will run about 20 minutes; however, the student controls the speed of the exercises. The stories are interesting and entertaining.

Our Weird & Wacky World-Critical Reading/Literal Comprehension ($40 Each)

Both these programs could be used by learners who possess about a 4th grade reading level ability. Each program contains eight humorous stories. Time-on-task requires about 15 minutes. Both programs use the cloze practice to assess reading ability. On Literal Comprehension, questions are asked that relate to word meaning. On Critical Reading, the questions relate more to the ability to recall detail than to measure critical understanding. But, both programs are well done and are excellent reading programs. As with Reading in the Content Area, students are referred back to specific sections in the story when they fail to adequately answer a question. These programs were designed for elementary students; nevertheless, our adults found them highly enjoyable.

English Basics - Synonyms and Homonyms

Both these programs are designed for learners at the 4th-and 5th-grade level; both require approximately 15 minutes to complete this exercise. In Homonyms, no effort is actually made to define what is meant by a homonym. Graphics are not used. Only several examples of homonyms are actually used; to, too, two, their, there, and they're. Synonyms also uses no graphics. Again, only a few examples are offered. Both these programs seem weak in terms of content covered and program design.

Punctuation No. I / Punctuation No. II ($50 each)

Punctuation No. I deals with the period, exclamation point, and question mark. Punctuation No. II covers the comma. Both programs make excellent use of color, sound, and graphics. Student errors are corrected by returning or referring back to the specific rule in the text which deals with that question. If a learner makes more than four errors in an exercise, the program will branch to additional drill related to that topic. Both programs are well designed. Instructional content will cover concepts introduced in grades 4 to 8.

Read and Solve Math Problems ($85)

Tutorial and drill strategies are used in a progressive series to assist learners grasp the important elements of verbal problems and learn how to convert them to numeric problems. Students at the 4th year level may be able to use this series. Excellent graphics are presented. The program is self-scoring and will provide immediate feedback. Branching to a more difficult level will occur only after the learner has mastered the level he/she is working on. Topics include: writing and using equations, key words in addition and subtraction, and problems without numbers.

Introduction to Mathematics on the Computer (40)

This program was designed to meet the needs of remedial students. Content will span material introduced in grades 2 to 5. The four basic math skills

are covered. Six different difficulty levels can be set. One interesting aspect of this program is that if a learner is unable to solve a problem with a second try, the computer will rephrase the same problem as a verbal problem. Learners need to achieve 85% accuracy in selecting correct responses in order for the student to be advanced to the next higher skill level. Designed specifically for remedial students, it is highly appropriate for the adult learner in remedial programming.

Introduction to Decimals on the Computer ($40)

This program has the same program design as Introduction to Mathematics on the Computer. It was designed, also, for remedial students.

Missing Math Facts ($40)

Provided with an answer, the learner must identify one of the missing components required to have arrived at that answer. Four difficulty levels can be set.

Percentage ($45)

Understanding fractions as a percent, finding the percent of a number, and understanding the basic principle behind percentages are the three content areas presented in this program. Both tutorial and drill strategies are employed.

Educational Courseware
Queue - 5 Chapel Hill Drive
Fairfield, CT 06432

IN MIE, Educational Courseware was rated No. 6 in 1982; however, two of their educational games, Distance Game and Estimation Game, were questioned by Joy Segall as to their actual educational value in a review appearing in MIE (August, 1982).

Educational Micro Systems, Inc.
Queue - 5 Chapel Hill Drive
Fairfield, CT 06432

Apple & TRS-80
disk & cassette

Whole Number Arithmetic Services by Teaching Objectives ($110) has been cited by The Computing Teacher (Vol.8 ,No.1) as excellent. In K-12 Micro Media, it has been cited as: "...the best educational software that we have seen for teaching arithmetic skills..." One outstanding graphics intended for positive reinforcement are optional. This feature allows this series to be easily adapted to either elementary students or remedial high school and adult learners.

The instructor can determine the number and type of problems, at various difficulty levels, in either a practice or test mode. In the practice mode, the student is guided through the problem-solving process with clear step-by-step assistance. Problems are presented and worked exactly as it would be on paper. In the test mode, a time limit, up to two minutes per problem, can be set. After the learner completes a set of problems, an analysis of errors is presented for the teacher. Feedback is excellent in the practice mode. The test mode identifies for the teacher the type of errors that are being made by the learner. Documentation is good.

Other programs available from Educational Micro Systems include: Fractions and Mixed Numbers ($23), Comprehensive Math Systems ($199), and Whole Number Arithmetic Worksheet/Test Generator Series ($19) which is a supplement for Whole Number Arithmetic Services by Teaching Objectives.

EduWare Services
2222 Sherman Way
Canoga Park, CA 91303

Apple & Atari

This produced has been rated in the top ten by MIE in 1981 and in the top twenty in 1982. Several of their programs have received excellent reviews.

Spelling Bee with Reading Primer ($35) has been called excellent by Dr. Jutkowitz in MIE. It presents instruction in beginning spelling and word recognition. The program first introduces 2 and 3 letter words, then 4 letter words, before presenting one and two syllable words. An interesting aspect to this program is the linking of familiar objects, through the use of graphics, with the printed word.

Compu-Read ($30) consists of four independent programs, and a file building system for the instructor, which are directed to building comprehension and retention skills. While the instructor can select the difficulty level, the program will adjust programming to match the learner's needs based on actual performance. The four programs are: character recognition, highspeed word recognition, synonyms and antonyms, and sentence comprehension. Instructional content will cover grades 1 to 6.

Compu-Math comprises four different programs and has received excellent comments. Programs include:

Arithmetic Skills ($50) has a high degree of flexibility in terms of selecting an appropriate difficulty level for various students. The four basic math operations are covered. Features include goal specification for each student, animated displays, immediate feedback, and skill verification for the various tasks. Content covers grades 1 to 4.

Decimals ($40) defines and explains various operations associated with decimals; conversions, rounding-off, and percentages. Content will cover operations covered in grades 3 to 7.

Fractions ($40) deals with defining and labeling various parts of a fraction. All basic math operations related to fractions are presented. Content will cover operations associated with instruction in grades 3 to 7.

Algebra I ($40) is a highly interactive program which deals with definitions, number line operations, sets, evaluating expressions, and rules for equation reductions. This program will present these basic concepts through four different techniques. Students can be exposed to these concepts by: learning through definitions, learning by rules and formulas, learning through example, and learning through problem solving. The rationale for this instructional design is to better match the strongest learning mode of the learner. Graphics are excellent in this program. The content and program design may be very appropriate for use in remedial type programming.

The Compu-Math series will provide a pre-test in each program in order to assess the learner's current skill level; all programs have good documentation.

George Earl — Apple
Queue - 5 Chapel Hill Drive
Fairfield, CT 06432

Two programs developed by George Earl might have some application in remedial programming. Mother Goose Rhymes ($25) will provide developmental practice in reading and spelling. Nearly all of the rhymes are contained on this one program. Although more obviously intended for elementary students, it may provide some exercises for the adult student in detecting and discussing some of the subtle meanings and implications behind the rhymes.

Reading in Literature ($30) presents approximately 30 different short stories, poems, and songs. Lines are presented with missing words which must be supplied by the student.

Hartley — Apple
Queue - 5 Chapel Hill Dr.
Fairfield, CT 06432

Hartley has been rated in the top 20 by MIE. Their courseware emphasis is in langauge arts and mathematics. The vast majority of language arts programs designed to cover content materials in the early primary grades use graphics which are appropriate for young children. While these programs are well designed, their use of animation may distract or disturb the adult learner. Hartley does not use graphics. The lack of this feature, in this case, adds to the appropriateness of using this series with adults.

Vowels Tutorial ($120) is intended for beginning readers. The program will branch to match the needs of the learner. A cassette tape player control device ($75) is required for aural instruction. Tutorial instruction is designed to cover content material introduced in grades 1 to 3.

Skill Drill 1 -- Consonants & Vowels -- ($137) These programs can be purchased separately. Consonants contains 28 lessons, and vowels will offer over 50 lessons. These are basically drill exercises related to early development skills in reading (grades 1-3). Aural stimulation can be provided with the addition of the Speller Box ($50) which can connect a cassette tape recorder to the Apple II computer.

Skill Drill II -- Affix, Homonym, & Plurals -- These three programs can be purchased for ($93) or separately. They follow the same format as Skill Drill I; aural stimulation is also possible.

Capitalization ($50) introduces the major rules related to this subject on a two-disk series. One disk is designed to provide practice by randomly presenting twenty sentences which are intended to provide practice in using the basic rules. The second disk is for testing. The teacher can modify or add additional materials to either disk. Lessons are appropriate for grades 3 to 8.

Nouns/Pronouns ($33) deals with recognition of common and proper nouns, possessives, noun plurals, identification of pronouns, and identification of antecedents. Different difficulty levels can be selected in order to better match the reading level of the learner.

Root/Affixes ($50) contains 21 lessons which are intended to stress the meaning of prefixes and suffixes and how they contribute to word meaning. Various reading levels can be set.

Verbs ($33) contains an advanced comprehensive multi-level program. Recognition and identification of verbs, tense, subject-predicate correspondence contractions, and correct usage is presented in drill and practice exercises. The vocabulary used in these exercises can be set to match the learner's reading level.

Vocabulary-Dolch ($40) presents drill and practice based on words appearing on the Dolch list.

We evaluated several programs by Hartley: Verbs ($33), Word Families ($30), and Who-What-When-Where-Why ($36). Each of these programs required 20 to 30 minutes to complete the exercises. They are appropriate for providing drill exercises on basic langauge skills required in grades 1 to 3. The program format is free from graphics and reinforcement which often characterizes programs which are essentially designed for young elementary children. This factor may make this series appropriate for adult learners.

High Technology
Box 14663
Oklahoma City, OK 73113

Apple & Atari

This producer is noted for their excellent design of several science programs. Colorful graphics and interesting simulations characterize their programs, but their target population seems to be college-bound high school students.

Instructional/Communications Technology (I/CT)
10 Stepar Place
Huntington Station, NY 11746

Apple

I/CT is associated with Milliken Publishing Company. Their Comprehension Power Program is the only series of programs we identified which seem specifically designed for adult learners in remedial programming.

The Comprehension Power Program contains 12 sets of disks, unfortunately, designed only to run on the Apple II computer. The 12 sets are intended to span reading levels one through twelve and are coded by letter names: Hi A, Hi B, and Hi C refers to high interest/low difficulty and are appropriate for adults requiring instruction at grade levels 1-3. Letters D-L correspond to grade levels 4-12.

Each set contains four disks. For example, Hi C would consist of four separate disks. Each disk will offer three instructional lessons and a management disk program which is intended to maintain individual student progress. The management system can hold up to 100 student records and can arrange students into five different classes or levels. The management system further allows the instructor to make individual assignments, review student and class performance, and receive a printed copy of individual and class achievement. A security system is provided which inhibits nonauthorized personnel and students from gaining access to student records.

Each Comprehension Power Lesson consists of three parts: Key Word Presentation, Preview, and Comprehension Reading.

Key Word Presentation exposes or introduces the learner to significant words which will be used in the story. These are presented in the context of full sentences. Available only in Hi A, Hi B, and Hi C is the option to have the key word flashed in the blank which appears in the context sentence. Every time the learner presses the "return" key on the computer, the word will flash at approximately one-tenth of a second. The student is required to correctly spell the flashed word. The computer will not accept an incorrect letter. The program forces the learner to correctly spell the flashed word.

I/CT (continued)

The Preview section consists of several brief paragraphs which offer an overview of the up-coming reading passage. Two or three questions are used to assess comprehension.

Comprehension Reading presents a series of segments. Each segment is introduced line-by-line at a predetermined rate set by the instructor or learner. The reading rate can be set at 50-650 words per minute. When the segment is completed, the student will be given one to three multiple choice questions related to that segment designed to assess critical thinking, recalling information, and general comprehension.

The learner or instructor can, also, select to read the segments without a speed controlled rate. In this mode six to eight lines of the segment will appear on the screen. The learner is able to advance the story by pressing a specific key.

The Comprehension Reading selection may consist of three to six segments. If a learner fails to correctly answer a question after a second attempt, the correct answer will be shown.

We were able to evaluate Level Hi C, Disk No. 4, which is intended to offer high interest/low difficulty passages at the 3rd-grade level.

Disk No. 4 contained three interesting and enjoyable stories which should easily be appreciated by adult or high school remedial students. Passages included: "Old 880," a story about an inept counterfeiter; "Overcoming Shyness;" and, "Buying a Used Car." Sentence structure, general vocabulary, and content of these stories are very appropriate for remedial programming. Introducing vocabulary words in context sentences and the preview section seem to work well in preparing learners to cope with the reading segments.

The only problem noted with this disk is that the reading selection is presented through a series of segments. After each segment, several questions will be asked to assess comprehension; but instead of automatically returning to the next segment, the learner is returned to the menu and must specifically select the next segment. This may interrupt and distract the reader.

Nevertheless, the overall quality of this program seems excellent for remedial instruction. Levels Hi A-C are the only programs to offer developmental skills in reading which seem specifically designed for adult and high school remedial students. We highly recommend this series based on the one disk we evaluated.

Interpretive Education
2306 Winters Drive
Kalamazoo, MI 49002

Apple

MCE series, developed by Interpretive Education, claim to offer assistance to adults and high school students in mastering basic living skills. They have received many favorable reviews. Their programs include: Job Readiness ($165), dealing with filling-out applications and locating work; Home Safe Home ($165); You Can Bank On It ($285), related to banking activities; Poison Proof Your Home ($210), Income Meets Expenses ($340); Comparative Buying ($165); Problem Solving in Everyday Math ($164); and, Money Management Assessment ($165).

We evaluated Money Management Assessment. This program will branch to an appropriate reading level depending on the learner's results on a pre-test. The required reading level will range from intermediate to lower elementary levels. The program provides good documentation. Various skills or concepts are introduced in four separate disks. These topic areas will cover basic vocabulary, working with income and expenses, filling-out deposit slips, working with a calendar, and basic operations related to addition, subtraction, multiplication, and division. Time-on-task for each exercise will run 20 to 30 minutes.

While the topics and subject areas seem highly appropriate for the adult learner, based on this program we cannot recommend this series. The entire program functions more as a diagnostic instrument to assess vocabulary or basic math operations. Little feedback or tutorial instruciton is provided to the learner in order to better understand concepts. In terms of technical design and instructional content, the program seemed weak.

J & S Software
140 Reid Ave.
Port Washington, NY 11050

Apple & TRS-80

J & S Software have concentrated their effort for high school level science. Most of their programs cost $20 and are examples of excellently designed branching programs; but like High Technology, they are intended for college-bound high school students.

Krell
21 Millbrook Drive
Stony Brook, NY 11790

Apple, TRS-80 & PET
disk and cassette

Noted for their SAT/GRE college board preparation courses and sophisticated adult games, they have been rated in the top 10 by MIE in both 1981 and 1982. One interesting game is Isaac Newton ($32); it is designed to develop inductive reasoning. One to four players must attempt to understand various principles which underline the rules of nature. Various difficulty levels can be selected. Remedial adults with a 6th grade reading level should be able to enjoy and appreciate some of the activities.

Mathware/Math City
4040 Palos Verdes Drive
202 Rolling Hills Estate, CA 90274

Apple

One program by Mathware has received favorable reviews. The Basic Math System ($350) is a comprehensive tutorial program covering five different subject areas: addition and subtraction, multiplication and division, fractions, decimals, and ratios/percents/negative integers. Each program can be purchased separately for $60. The difficulty level will vary depending on the learner's ability to solve problems. Both interaction and responsiveness have been reported to be excellent by MIE.

Minnesota Educational Computing Consortium (MECC)
2520 Broadway Drive
St. Paul, MN 55113

Apple-starting to produce for the TRS-80 and Atari

Materials by MECC generally receive favorable reviews. Their materials have excellent documentation, and they make good use of the technical features of the computer: graphics, color, and sound. Most of their programs will cost about $20; they have produced two extensive series for both elementary and secondary students. Instruction is generally presented in game or simulation formats.

We had the opportunity to evaluate their demonstration disk. Basically, while their programs are well suited for elementary students, the use of graphics and gaming formats does not seem appropriate for adults. We were not able to preview Spelling-Volume II which was designed for adults. Common misspelled words are presented, but the teacher can replace and add words and sentences to generate additional drill exercises.

Merry Bee
Queue - 5 Chaple Hill Dr.
Fairfield, CT 06432

Apple

Many of the programs developed by Merry Bee are designed for early primary students. One program dealing with alphabetizing and beginning dictionary skills may be useful for adults who need assistance in this area. Alphabetta ($30) presents a series of activities related to identifying letters and locating letters in a dictionary. The computer will require students to enter the correct response by delaying any further questions until the present question is correctly answered. Many of the activities in this series are suitable for adults; they limit graphics and illustrations which might distract the adult learner.

Micro Computer Workshoppe
Queue - 5 Chapel Hill Drive
Fairfield, CT 06432

Apple, TRS-80, & PET disk & cassette

They have been rated in the top 20 by MIE. Several of their math programs have received excellent reviews in various journals. Their math programs were designed by math teachers and provide step-by-step assistance in problem solving.

Long Division ($25) allows the learner to select 1, 2, or 3 digit problems. Questions will randomize. The procedures which students will follow to solve problems are similar to what those students would follow on paper. Each step in the long division process is entered one digit at a time with a cursor assisting the learner locate the position of the next required entry. Errors are immediately signaled, and the learner may re-enter a new response. If the learner makes two consecutive errors at the same step, the correct answer will be shown. The student can then continue with the remaining steps in the problem.

Addition with Carry ($25) allows the student to decide the size of the addition problems up to nine rows and nine columns. Problems will randomize.

Multiplication ($25) permits the student to select the number of digits which will be presented: 1, 2, or 3 digit problems can be generated.

These three programs will cover content material introduced in grades 3 to 8. Flexibility and responsiveness makes these programs highly acceptable for adults.

Micro Ed
Queue - 5 Chapel Hill Drive
Fairfield, CT 06432

PET
cassette

One of the more prolific producers of software, Micro Ed has been rated No. 4 in 1981 and No. 12 in 1982 by MIE. They have developed a broad series of language arts, reading, and math programs basically for the PET computer. Type to Read and Usage Bonners have been recommended for use with adult students.

Type to Read is designed to assist students develop word attack skills which are presented in the early primary grades. Over a thousand words are phonetically grouped. Each lesson will begin by displaying a complete sentence on the video screen. The student is required to type the sentence as it appears on the screen. When that task is finished, the sentence reappears with a word missing. The student is required to fill-in the missing word. Eventually, the student is expected to type in the complete sentence from memory. At the end of each exercise, performance is evaluated. Type to Read contains four sets:

Set A ($115) deals with short vowels between a single consonant--15 cassette tapes.
Set B ($130) contains words which use consonants at the beginning and end of words--17 cassette tapes.
Set C ($157) uses more difficult consonant blends--21 tapes.
Set D ($175) presents common vowel digraphs and diphthongs--24 tapes.

Micro Ed (continued)

Usage Bonners ($100) is a 15 part program designed to offer drill on common usage errors, such as subject/verb agreement, double negatives, etc. The program will provide immediate feedback to the student and demonstrate how usage errors in each problem should be corrected. The format design is typical of what students will experience in standardized achievement tests. Content will cover material presented in grades 5 to 12.

We evaluated several programs by Micro Ed: Drill and Practice Spelling Series D and E and Punctuation ($56). Both programs use little graphics; while this may be a poor design feature for elementary children, it is appropriate for adults. Spelling lacks adequate feedback and offered no insight into the basic rules which underline concepts for correct spelling. Punctuation did provide good drill practice but also lacked meaningful feedback.

Micro Lab Learning Center
3218 Skokie Valley Rd.
Highland Park, IL 60035

Apple

U.S. Constitution ($30) can provide both a critical reading exercise and basic history lesson. The level of difficulty can be set to allow the programs to be adapted to students with low reading skills, 5th-or 6th-grade level. Two different modes can be used. In the instructional mode certain passages will be presented to the learner. If the student fails to answer a question related to the previously exposed passage, the program will refer the student back automatically to the specific passage. The test mode will not allow the student to review certain passages.

Micro Learningware
Box 2134
North Manksto, MN 56001

PET

They have produced several programs for economics, business, U.S. history, geography, and mathematics. Gayle Bushlack, writing in MIE, stated that as a teacher she would not want to use their math package due to its lack of feedback.

Micro Power & Light
1108 Keystone Park
Dallas, TX 75243

Apple

Adult students with a 5th-grade reading ability may enjoy Advertising Techniques ($25). The program is directed at assisting students understand persuasive wording.

They have developed several programs for language arts. Commas ($30) presents 12 basic rules for use of the comma. If a student has a problem with a question, the program will refer back to the specific rule.

Micro Power & Light (continued)

Sentences ($25) is intended to assist the student identify subjects, verbs, predicates, and sentence fragments. It incorporates both tutorial and drill activities. Some exercises will use a gaming format. Graphic and sound are good. Exercises will require 15 to 30 minutes to complete.

Microphys
Queue - 5 Chapel Dr.
Fairfield, CT 06432

PET (started for Apple)
cassette

Microphys is one of the most prolific producers of software. They were virtually exclusive for the PET, but now are starting to design programs for the Apple. They have an extensive listing of language arts and math programs available. Their programs are designed to offer drill exercises rather than tutorial instruction. They have received some mixed reviews.

We evaluated only one program, Verbal Problems Geometry VI, and were less than satisfied with the quality of the program in addressing the needs of adult students. Problems are presented on the screen, but must be worked out on paper. No feedback is offered to the learner, or indication of correct/incorrect responses, until the entire exercise is completed. No effort is made in assisting the student to correct or understand errors.

Milliken
1100 Research Blvd.
St. Louis, MO 63132

Apple, TRS-80, PET
disk & cassette

see IC/T - Comprehension Power Series

Several comprehensive series have been developed by Milliken: Math Sequences ($450); Language Arts-Grammar ($375); Language Arts-Study Skills ($75) dealing with alphabetization; and Writing Skills, practice in combining sentences.

Their most noted series is the Math Sequence. It is a comprehensive, objective-based curriculum designed to provide drill and practice. It has a management system, allowing teachers to follow student achievement and assign additional assignments. Documentation is excellent. The scope of material is perhaps more extensive than any other product available on the market. It has received reviews ranging from good to excellent. Educators we have contacted who use this series are well satisfied with the programs. Record-keeping is excellent due to the management system. There are some weak points that have been cited. Some of the complicated division and multiplication problems do not clearly demonstrate the correct process needed to solve the problem if students make errors. The program is not designed for independent student use. Feedback will demonstrate what numbers should have been used in the problem but does not explain why. This is an adequate, perhaps excellent, program combined with a teacher's instructional guidance.

MUSE
330 N. Charles St.
Baltimore, MD 21201

Apple

Their reputation is based on the excellent quality of their game and simulation programs. Best of Muse ($40) contains five of their most popular games. Three Mile Island ($40) is an excellent simulation. Graphics and color are excellent. They may provide enrichment activities for adults.

NTS
680 North Arrowhead Ave.
Rialto, CA 92376

Apple & TRS-80
disk & cassette

MIE has rated NTS in the top ten for both 1981 and 1982. Their math, reading, and language arts programs have generally received favorable reviews. One series called Starting Out ($130) introduces basic math concepts for the primary level. They have produced a Spanish version of this series. In fact, several of their programs will have a Spanish translation. Words Are Fun - Set 1 and Set 2 ($130 each) covers basic concepts used in grades 2 to 6; again, they have made a Spanish version. Many of their programs use a game format and have been cited for excellent graphics.

Orange Cherry Media
Queue - 5 Chapel Hill Drive
Fairfield, CT 06432

Apple, TRS-80, & PET
disk and cassette

Rated as one of the top ten producers in both 1981 and 1982, Orange Cherry Media has desinged several excellent reading and language arts programs.

Working With The Alphabet ($34) and Alphabetical Order ($15) provide several activities related to sequencing and proper-ordering. Different difficulty levels can be chosen.

Spelling ($34) contains two programs: See and Spell and The Spelling Bee. See and Spell presents words in a tachistoscope type system. Students must spell the correct version of the word when it disappears from the screen. Three different spellings of a word are offered in The Spelling Bee; and the student is supposed to select the correct spelling. Words are presented within the context of a sentence. The difficulty level in both programs can be set to cover words presented in grades 2 to 6.

Cloze Technique for Developing Comprehension ($34) offers a multiple choice format to students from which a correct word must be selected to fill-in a blank space from a reading passage. The program seems appropriate for grades 3 to 6.

Active Reader - World of Nature Series ($67) offers high interest stories for the learner with limited reading skills - grade level 2 to 5. Topics include: Reading About Unusual Animals, Sharks and Animals of the Sea, Reading About Earthquakes and Volcanoes, and Reading About Planets. This series is excellent for remedial students.

Adventures Around the World ($67) is another high achievement/low skill level series. Content seems appropriate for students at the 3 to 6 grade level. As in the World of Nature Series, questions are placed throughout the story to assess comprehension. The four stories included in this series are:: Let's Take a Safari, Climbing Mount Everest, A Frozen Trip to Antarctica, and Journey Under the Sea.

Program Design Inc.
11 Idar Court
Greenwich, CT 06830

Apple, TRS-80, & PET
disk & cassette

Program Design has been rated as one of the top five producers in 1981 and 1982 by MIE. Several of their programs have received excellent reviews.

Reading Comprehension: What's Different ($24) has been rated high by Courseware Report Card and favorably reviewed by our staff. The program is designed to present a series of four words to the learner; the object is to identify the one word that does not belong in the group. Ten study units are presented covering vocabulary words associated with instruction in grades 3 to 6. The learner can control the length of each exercise. Students will be informed why answers were correct. An incorrect response will require the student to try (or guess) again before the program will advance to the next group of words. Graphics are not used in this series which makes the program more appropriate for the adult learner who may need help in vocabulary development and sight word recognition.

Vocabulary Builder I ($17) offers drill on synonyms and antonyms. Over 400 questions are purported to be asked on this series of eleven programs. It is intended for early primary instruction.

Vocabulary Builder II ($17) is an advanced listing of vocabulary words designed for grades 5 to 8.

Spelling Builder ($26) contains eight programs which introduces and reinforces basic spelling rules and gimmicks for mastering difficult words. Some effort is made at developing word-attack skills. Over 250 words are used. Content seems appropriate for upper elementary and high school levels.

Quality Educational Design
Box 12486
Portland, OR 97212

Apple & TRS-80
disk & cassette

Although rated No. 11 in 1982 by MIE, many of the catalogs we had access to did not carry any of the programs from Quality Educational Design. However, two of their math programs have received some good reviews in MIE. Factoring Whole Numbers ($75) and Fractions ($150) both used an A and B operational mode. In the A mode, basic drill activities are provided; but, in the B mode, the concepts introduced in A are expanded through gaming, testing, and enrichment activities.

Random House
400 Hahn RD.
Westminister, MD 21157

Apple & TRS-80

There are a wide range of programs in different design systems available from Random House. Several of their small programs have received poor reviews: Story Starter, Word Shooter, and Word Zapper. However, BLS--a division of Random House--has developed a comprehension series called Tutorcourse and Tutorprogram. Programs in these series include: basic mathematics, career arithmetic, langauge arts/reading, grammar, career English, spelling, science, and technical/vocational instruction. These techniques, offer true instructional programming, and include a built-in criterion reference test. They are only available for the Apple, and the cost for complete series is relatively high. The Reading Comprehension Course (grades 3-4) costs $714.

Also, Random House has marketed a series called High Intensity Learning Systems. It is intended to provide mastery learning through a "totally individualized, diagnostic-prescriptive-evaluative approach to learning." HILS 2 Reading ($500) requires two disk drives, but offers a student management system. Due to the cost and the fact that we were not aware of these series until relatively late into our project, we did not acquire any of their comprehensive programs. In addition, we are not aware of any evaluations of these series appearing in computer journals.

Right on Programs
Queue - 5 Chapel Dr.
Fairfield, CT 06432

Apple & PET
disk & cassette

An extensive series of programs are available from Right on Programs. In addition to programs covering the basic subjects, they have produced programs for elementary and secondary social studies and science. Also, they have designed a series dealing with library competencies, such as learning to use the table of contents, understanding the card catalog, and learning how to use index cards. Most of the programs in this series cost about $15. In 1981 Right on Programs were rated No. 3 by MIE; however, they were not included in the top twenty for 1982. Several of their programs have received mixed reviews.

Scholastic Inc.
904 Sylvan Ave.
Englewood Cliffs, NJ 17632

A series of programs developed as a IV-C federal grant at Robbinsdale Area Schools is distributed through Scholastic, Inc. Because the programs were developed, at least in part, with federal funds, the cost for acquiring these programs should not exceed duplication and distribution costs. At about $10 per program, they seem to be within the range. The programs we looked at were:

Scholastic Inc. (continued)

Blast-Off 100 is a computerized version of hang-man, except when the hidden word is identified through selective guessing, an animated rocket will take-off. The program is appropriate for elementary children in grades 3 to 5, not remedial adults.

Column Add allows the student or teacher to determine the number of columns (2 or 3) and the number of rolls (3, 5, or 7). This program is adequate in presenting drill and practice. After two incorrect tries, the correct answer will be shown to the student.

Math will randomize problems related to basic operations. A flexible menu will allow the difficulty level to be adjusted to address the needs of learners who could benefit from drill related to basic elementary skills in computation.

Math-Fractions was considered excellent by our evaluation team. Graphics are well used to assist the learner understand equivalent expressions. Comparisons of fractions are presented in two parts. Part 1 deals with fractions that contain a numerator of 1. Part 2 will demonstrate fractions with numerators greater than 1. The program is appropriate for covering content material associated with grades 4 to 6.

Math-Addition is designed for early elementary students. A grid is displayed on the video screen containing a sequence of numbers. The learner is asked to identify a missing number in that sequence. Graphics seems more appropriate for children.

Math-Multiplication Tables uses a display grid containing multiplication tables. The learner is expected to identify missing numbers to adequately complete the grid. Seems more appropriate for young children than adults, yet it can provide good drill exercises.

All of the Robbinsdale programs will require approximately 10 to 15 minutes to complete. Some effort is directed at providing instructional assistance, but in general the design is intendend for drill exercises. The cost of these programs are extremely reasonable. Math-fractions seems well suited for adult instruction.

South West Ed Psych Services
Queue - 5 Chapel Hill Drive
Fairfield, CT 06432

Rated in the top twenty by MIE in 1982, they have received favorable reviews in Softalk (May, 1981) and Creative Computing (October, 1981) for a series of programs which utilizes colorful graphics and a gaming format to present basic instruction. The Math Machine ($80), Spelling Machine ($50), Spelling Sorcery ($30), and Reading Machine ($60), however seem more appropriate for elementary students.

South West Ed Psych Services (continued)

The Reading Machine uses graphic pictures in order to associate words to a visual image. The program attempts to use a phonics approach which will be consistent with major texts. Large size letters are used in presenting activities related to matching letters, sequencing, building vocabulary, and working with consonant blends and vowels. This program may be ideal for kindergarten and early primary students, but the graphics are not intended for adults.

Steketee (name changed to Edu-Soft) — Apple TRS-80
Queue - 5 Chaple Hill Drive — for Atari
Fairfield, CT 06432

Steketee, or Edu-Soft, has produced some math programs which have earned favorable comments.

Fraction Recognition/Mixed Numbers ($18) is designed for intermediate grade level instruction. Extensive use of graphics is used to visually demonstrate fractional parts in a geometric figure. Aural beeps are used.

Speed Drill/Number Line ($17) and Speed Drill/Guess the Number ($18) both use graphic displays and reinforcement which seem to be more appropriate for younger students. Accuracy and speed in computation is assessed through these programs.

Sterling Swift
Queue - 5 Chapel Drive
Fairfield, CT 06432

Sterling Swift has a strong reputation in developing quality computer literacy programs. However, they have recently begun developing language and math programs.

The Classroom Learning System ($450) consists of two sets: Whole numbers and Fractions/Decimals. The program is intended to instruction covering grades 4 to 8; it is also suggested for remedial high school students. The program uses a student management system which can trace up to 200 students. The program is purported to provide diagnostic/prescriptive learning. A review by Leslie Eiser appearing in MIC (March, 1982) indicated that aspects of the program seemed excellent, but the evaluation was based on a demonstration disk. Also, she felt that the pace of instruction, which is controlled by the computer, seemed slow. An interesting feature to this series is a verson produced in Spanish.

Sunburst
39 Washington Ave.
Pleasantville, NY 10570

Apple, TRS-80 & PET
disk & cassette

We did not see any reviews of Sunburst products, but several of their programs looked interesting, such as, Micro Survival Math ($50) which is intended to provide simulations requiring math operations in various consumer roles.

We did evaluate a reading series which is based on Newbery Award winners. These programs can provide high interest/low difficulty content which seems highly appropriate for remedial programming.

The Island of the Blue Dolphins (sets of four cost $80) is typical of the programs we evaluated. The learner is given the paperback story to read. Four different computer programs are then used to assess different aspects of reading competency. Program No. 1 will cover a broad range of comprehensive skills. An incomplete sentence, based on the story, will be displayed on the video screen. The student must recall information from the story in order to complete the sentence. If the student fails to correctly answer the question, a hint will be offered to assist the learner recall the correct response. After two incorrect responses, the correct answer will be given. In the final review section of the program, the learner will be shown all the sentences which he/she failed to correctly answer. The student will be given specific pages in the story which relate to the incorrect responses. Program No. 2 is designed to develop vocabulary based on the words presented in the story. A multiple choice format is used for students to fill-in missing words in a displayed sentence. Program No. 3 requires the learner to list events as they occurred in the story. Program No. 4 offers an enrichment activity related to the story, such as, a cross-word puzzle. We were impressed with the quality of the cross-word puzzle and feel that adults would enjoy working on this activity. If adults can be motivated to use the Newbery Award series, these programs should be excellent. Graphics are not used, again this should enhance the value of this series for adult learners and high school remedial students. Each set contains one paperback book, two cassette tapes or one disk, a teacher's guide to the story, and an instructors manual.

Teacher's Pet
1517 Holly St.
Berkeley, CA 94703

PET

We reviewed a series of language arts programs designed by Glenn Fisher. They are inexpensive and use basic technical design features; they are designed to provide good drill activities.

Teacher's Pet (continued)

Adverbs ($9) provides instruction and drill in identifying adverbs in sentences. A complete sentence will appear on the video screen; through random selection a word will be underlined. The student is supposed to indicate if that word is an adverb. The program is appropriate to cover content usually introduced in grades 4 to 8. Activities usually require 15 minutes. If a student makes several errors, the program will refer to some rules for defining adverbs. The instructor can add new sentences as substitutes for the ones used in the program.

Capitals ($9) presents the learner with a sentence which has one word boxed-off. The learner must indicate if that word should be capitalized. Comma ($9) follows the same design format; students are asked if the boxed-off word should be followed by a comma. As with Adverbs, a brief explanation will be automatically shown if the student cannot find the correct response after two efforts. The teacher can substitute words and sentences. But with these programs the random selection of questions leaves a lot to be desired. Most responses will be negative. For example, it is not certain if a student is learning what adverbs actually are or is learning what adverbs are not.

In both these programs, it is very easy for students to guess at correct responses. These drill exercises are less than adequate in reinforcing and developing insight into correct usage.

Verbs I ($10) provides drill on the use of "is" and "are", or "was" and "were".

Spelling-Grade 7 ($21) presents a list of words in groups of four. The learner is supposed to identify the incorrect spelling. Content seems adequate for students preparing for the General Equivalency Examination.

Spelling Tutor ($7) allows the instructor the capability of setting their own list of words. The words will flash on the screen for a length of time determined by the instructor. The student must correctly type the flashed word in order for the computer to advance to the next word listed. This program is an "authoring system" and seems to be the most adequate of this series of programs for application in remedial programming.

Teaching Tools
Queue - 5 Chapel Hill Drive
Firfield, CT 06432

PET
cassette

Addition and Subtraction ($20 each) provides drill on basic math operations usually presented in grades 1 to 6. The instructor or student has sufficient flexibility in the menu to determine the difficulty level, set the number of problems, and even set a time limit for completion of the exercise. Graphics used are intended for elementary students.

TYC Software
40 Stuyvesant Manor
Genesco, NY 14454

TRS-80
cassette

TYC has developed an English Grammar series from grades 3 to 12 for $6 per program, and an English-Working series which covers synonyms and antonyms, adjectives, adverbs, contractions, subjects and nouns, pronouns, and verbs. The cost per program in this series is also $6. Other programs cover a range of activities including foreign languages, high school level science programs, spelling programs covering grades 1 to 8, and a series of vocabulary building programs. However, we have not found many positive reviews related to TYC software. Many of TYC educational programs use a gaming format. For these reasons we did not think that TYC would be appropriate for adult remedial programs.

Universal Systems for Education, Inc.
Queue - 5 Chapel Hill Dr.
Fairfield, CT 06432

Apple

One program which we did not evaluate, or find any critical reviews, nevertheless seemed very promising. The PAL program ($100) is purported by its authors to use a diagnostic/remediation approach in teaching reading. The program is designed to cover the entire scope of reading education from grades 2 to 6. The program is claimed to evaluate 40 major reading skills and up to 160 subskills per grade level. Up to 400 remediation exercises are available for each grade level in addition to diaganostic testing for each level.

Wise Owl Workshop
Box 1168
Livermore, CA 94550

Apple & TRS-80
disk and cassette

We generally heard favorable comments about Wise Owl programs. But, the programs that we were aware of used gaming formats which were directed at young elementary students, such as, Hangman ($10), Flash Cards ($10), and Jabberwocky ($10).

An Overview: Instructional Software for Adult Learners

The most startling observation, in connection with our survey, is that we were only able to identify one series of programs which in terms of content and format design seems specifically suited for adults in remedial programs. Nevertheless, at the intermediate grade levels (5-8), there does not seem to be a serious problem in identifying programs which can be adopted for adult programming. A large number of quality courseware, covering all the basic skills, are available at this level. Although intended for school-aged children, the instructional content and technical format are not significantly inconsistent to what might be ideally designed for adult learners.

At the primary level (0-4) there is a serious lack of courseware which can be meaningfully used in an educational setting for adults. Simply, Software at this level has been designed to motivate, attract, amuse, and instruct young children. Educational content and technical design have been planned to appeal to immature minds. Instruction, at this level, is often provided in a gaming format, such as: hangman, blast-off, super car racer, and tank attack. Even for elementary students it is difficult to construct a comprehensive language arts or math program based on gaming activities. While these activities may hold the potential of engaging young students, they are likely to embarrass or insult adults. Graphics and animated figures, which are also pervasive in courseware designed for the early primary levels, are generally inappropriate for adults.

Problems experienced in acquiring quality courseware for adults at the early primary instructional level was anticipated, but more difficult to understand is the lack of suitable courseware at the high school level (9-12). In terms of content materials and instructional format, design features for high school students and adult learners should virtually be compatible. The problem is that most of the courseware seems directed to the college-bound high school student. Relatively little has been developed for remedial programming at the high school level. We are not aware of any program designed to assess a learner's potential for passing the High School Equivalency Examination or designed specifically to assist adults preparing for this test. While there are several programs which purport to offer life-skill competencies, we are unable to recommend any series. We have not found more than five producers who have developed courseware with a Spanish text version. Although the computer, through visual and verbal association, may be ideal for introducing English as a second language; we have not found a single program designed for this purpose.

Courseware development, directed at addressing the needs of educationally disadvantaged adults, has been neglected. Regretfully, this may be reflective of a national disposition to adult education. As a priority, federal and state support for adult education has been low. As a policy, public education has often forgotten their students after graduation. But, as a principle, those involved and dedicated to the needs of adult learners have optimally used available resources in order to provide a quality educational program.

Through careful screening and evaluation of courseware, it should be possible to select a series of programs which, at the very least, would be adequate in utilizing computer assisted instruction for adult learners.

Selective Courseware for Adult Educational Programming

In determining what programs may be most suited for remedial adult learners, we were very fortunate to secure the services of Joy Segall and Jonathan D. Kantrowitz. In addition to their thorough familiarity of computer courseware and expertise in evaluating software, both consultants for this project have been involved in adult education. Specifically, we requested that they select courseware for three general instructional levels: (0-4), (5-8), and (9-12). We posed a hypothetical problem: allowed $1000 for each level what programs would you select? also, if you had access to $2000 what additional programs would you acquire?

After each entry, a page number will be offered allowing reference to the Courseware Survey Section for additional information. Keep-in-mind that although the cost may be given for an Apple disk, the producer may have also designed the program to run on other computer models and on cassette recorders.

Adult Basic Education (0-4) Instructional Level

$1000 Budget

1. ALPHABETTA	Merry Bee Apple disk $29.95	(p. 38)
2. ALPHABETICAL ORDER	Orange Cherry Media Apple disk $34.00	(p. 42)
3. VOWELS	Hartley Apple disk $93.05 with cassette control device $79.95	(p. 33)
4. CONSONANTS	Hartley Apple disk $79.95	(p. 33)
5. COMPREHENSION POWER (Levels A-C).....	IC/T Apple disk $425.00	(p. 35)
6. CLOZE TECHNIQUE	Orange Cherry Media Apple disk $34.00	(p. 42)
7. COMPU-READ	Edu-Ware Services Apple disk $29.95	(p. 32)
8. WHOLE NUMBER ARITHMETIC	Educational Micro Systems Apple disk $24.95	(p. 31)
9. LONG DIVISION	Microcomputer Workshops Apple disk $24.95	(p. 38)
10. INTRODUCTION TO MATHEMATICS	Educational Activities Apple disk $39.95	(p. 29)

Adult Basic Education (0-4) Instructional Level

$2,000 Budget

1. SPELLING	Orange Cherry Media Apple disk $34.00		(p. 42)
2. THE VOWEL TUTORIAL	Hartley Apple disk $120.00		(p. 33)
3. BASIC READING SKILLS and PRACTICES A-D..	Brain Bank Apple disk $240.00		(p. 25)
4. OUR WEIRD & WACKY WORLD	Educational Activities Apple disk $79.90		(p. 29)
5. VOCABULARY DOLCH	Hartley Apple disk $39.95		(p. 33)
6. MULTIPLE SKILLS	Hartley Apple disk $92.95		(p. 33)
7. WHO, WHAT, WHERE, WHEN, WHY	Hartley Apple disk $35.95		(p. 33)
8. WORD FAMILIES	Hartley Apple disk $29.95		(p. 33)
9. ADDITION, SUBTRACTION, MULTIPLICATION ..	Microcomputer Workshops Apple disk $74.85		(p. 38)
10. MISSING MATH FACTS	Educational Activities Apple disk $39.95		(p. 29)

Adult Basic Education (4-8) Instructional Level

$1,000 Budget

1. COMPREHENSION POWER	IC/T (Grades 4-6) Apple disk $425.00	(p. 35)
2. HOW TO READ IN THE CONTENT AREAS	Educational Activities Apple disk $179.00	(p. 29)
3. ACTIVE READER-WORLD OF NATURE SERIES ...	Orange Cherry Media Apple disk $67.00	(p. 42)
4. ENGLISH BASICS	Educational Activities Apple disk $209.95	(p. 29)
5. READ & SOLVE MATH PROBLEMS	Educational Activities Apple disk $85.00	(p. 29)
6. INTRODUCTION TO DECIMALS	Educational Activities Apple disk $39.95	(p. 29)

$2,000 Budget

1. CAPITALIZATION	Hartley Apple disk $49.95	(p. 33)
2. DESCRIPTIVE READING	Educational Activities Apple disk $245.00	(p. 29)
3. ADVENTURES AROUND THE WORLD	Orange Cherry Media Apple disk $84.00	(p. 42)
4. PUNCTUATION	Educational Activities Apple disk $93.00	(p. 29)

Adult Basic Education (4-8) Instructional Level (continued)

5. SPELLING BUILDER	Program Design Inc. Apple disk	$26.50	(p. 43)
6. INTERMEDIATE MATH SKILLS	Orange Cherry Media Apple disk	$67.00	(p. 42)
7. OPPOSITES	Hartley Apple disk	$29.95	(p. 33)
8. VERB USAGE	Hartley Apple disk	$49.95	(p. 33)
9. VERBS	Hartley Apple disk	$32.95	(p. 33)
10. HOMONYMS	Hartley Apple disk	$39.95	(p. 33)
11. NOUNS/PRONOUNS	Hartley Apple disk	$32.95	(p. 33)
12. ROOTS/AFFIXES	Hartley Apple disk	$39.95	(p. 33)
13. ANTONYMS/SYNONYMS	Hartley Apple disk	$39.95	(p. 33)
14. SPEED DRILL	Edu-Soft Apple disk	$19.95	(p. 46)

Adult Basic Education (9-12) High School Equivalency

$1,000 Budget

1. COMPREHENSION POWER	IC/T Apple disk $575.00	(p. 35)
2. PERCENTAGES	Educational Activities Apple disk $45.00	(p. 29)
3. EQUATIONS	Educational Activities Apple disk $45.00	(p. 29)
4. BASIC MATH COMPETENCY SKILL DRILLS	Educational Activities Apple disk $203.00	(p. 29)
5. COMPU-MATH FRACTIONS, DECIMALS and ALGEBRA I	Edu-Ware Services Apple disk $129.85	(p. 32)

ALSO RECOMMENDED

1. FRACTION CONCEPTS, DECIMAL CONCEPTS, RATIOS and PERCENTS	Mathware Apple disk $119.85	(p. 38)
2. VOCABULARY BUILDER I	Program Design Inc. Apple disk $23.95	(p. 43)
3. ENGLISH ACHIEVEMENT I-V	Microcomputer Workshops Apple disk $199.75	(p. 38)

Commentary Related to Kantrowitz and Segall's Priority Listing

The most immediate reaction by our evaluation team centered around their selection of Hartley's materials. We had mixed emotions as to the overall quality of these programs--based on what we evaluated. Their selection at the (0-4) grade level can be justified on the basis that these programs use little graphics which would distract adult learners. However, some of our staff felt that these programs were simply dull, lacked creativity, and were ineffectual in realizing certain educational objectives. Other staff members believed that these programs were acceptable.

We had no problems with any other selections made by Mr. Kantrowitz and Mr. Segall. For developing reading skills our staff would have included Sunburst's Newbery Aware Winners at the (5-8) and (9-12) grade levels. Although related to science, Brain Bank's The Human Body could be effective in developing comprehension skills and should work excellently in adult educational programs.

Recommendations

In terms of resources, human and financial, presenting computer assisted instruction is costly. The potential advantage of this medium in addressing certain educational objectives seems to justify this effort. Efficiency and cost/effectiveness should motivate school districts and agencies to seek means to identify cost-sharing measures in utilizing computer assisted instruction to address different educational objectives.

Since the majority of adult educational programs are offered in the evening hours, coordinating the access to equipment and courseware between adult educational services and other instructional programs seems highly possible. If federal funds are involved in supporting any program, cost sharing arrangements should be discussed with appropriate state representatives.

The courseware which was identified through this survey should also be effective in presenting programming to educationally disadvantaged elementary and secondary students. Agencies should attempt to acquire courseware which affords the broadest possible application.

Adult educators may wish to form consortia in order to develop courseware or authoring systems to address some of the instructional levels and subjects which lack adequate commercial program development, such as: (0-4), language arts; and, (9-12) high school equivalency examination preparation.

APPENDIX A

Catalogs/Directories

Apple II/III Software Directory
by Vanloves
350 Union Station
Kansas City, MO 64108
(913) 384-3860

Comprehensive listing of software for the Apple computer. Considering the number of free catalogs available, it may not be the best bargain on the market because of its price of $22.50. As with all catalogs, there is no effort to provide a critical evaluation. This directory does provide a fairly extensive list of product vendors.

Educational Software Directory (1982) - Apple II Edition
Sterling Swift Pub. Co.
1600 Fortview Rd.
Austin, TX 78704
$14.95

Perhaps the most comprehensive directory for Apple software; format is clear and well designed. (highly recommended)

TRS-80 Software Sourcebook
Radio Shack
1600 One Tandy Center
Fort Worth, Texas 76102
$10.95

A vendor may provide this sourcebook without charging. Again, with the number of free catalogs, there is not a compelling motive to pay for a catalog.

Queue
5 Chapel Hill Dr.
Fairfield, CT 06432
$22.00

Catalog IV-A is a directory for Apple, Atari, and Compucolor. Catalog IV-B is for TRS-80 and PET; regular supplements are published to update information. This catalog services was one of the first to be established. It may offer one of the most extensive listings for educational software. Nearly all independent producers are represented. Queue will allow a discount to school districts and provide a 30 day preview period. (highly recommended)

Catalogs (Distributed Free to School Districts

American Micro Media
Box 306
Red Hook, NY 12571

models: Apple/TRS-80/PET/Atari

emphasis: general K-12
listings: 100 various programs
guarantee: 30 day return period

BLS Inc.-Random House
400 Hahn Road
Westminster, MD 21157

model: Apple

emphasis: tutorial programs featuring branching
guarantee: not indicated
toll call: (800) 638-6460

Brain Bank (Box)
601 West 26th St.
New York, NY 10001

models: Apple-TRS-80/PET

emphasis: reading, language arts and science
guarantee: not indicated
discounts: up to 60% for additional copies of programs

Carolina Software
2700 York Road
Burlington, NC 27215

models: Apple/TRS-80/PET/Texas Inst.

emphasis: science
guarantee: 14 day return period
toll call: (800) 334-5551

Creative Computing
39 E. Hanover Ave.
Morris Plains, NJ 07950

models: Apple/TRS-80/PET
Atari/CP-M, Texas Instr.
Sorcerer
emphasis: generl K-12
discount: allowed to schools
toll call: (800) 345-8112

C.E.R.F., Inc.
1441 N. 27th Lane
Phoenix, AZ 85009

model: PET

emphasis: extensive listing for PET software
guarantee: not indicated

GAMCO
Box 310
Big Spring, TX 97920

models: Apple/TRS-80/PET

emphasis: general K-12

guarantee: 30 day return period
discounts: free shipment

K-12 Micro Media
Box 17
Valley Cottage, NY 10989

models: Apple/TRS-80/PET

emphasis: general K-12
listings: over 80 vendors represented

Catalogs (Distributed Free to School Districts)

Educational Activities Inc.
Box 392
Freeport, NY 10565

models: Apple/TRS-80/PET

emphasis: courseware designed by Educational Activities
guarantee: right to return programs, and consultants are available to assist schools select appropriate courseware
toll call: (800) 645-3739

The Micro Center
Box 6
Pleasantville, NY 10570

models: Apple/TRS-80/PET/Atari

emphasis: general 12
listings: over 60 vendors
guarantee: programs are pre-screened be educators
30 day return period

Multi-Media and Micro Programs
157 S. Kalamazoo Mall
Kalamazoo, MI 49003

model: Apple

emphasis: special needs of adults learners/basic living skills
guarantee: 30 day return period
collect: (616) 345-8681

Selected Micro Software
8950 Lurline Ave.
Chatsworth, CA 91311

models: Apple/TRS-80/PET/Atari

emphasis: general K-12
guarantee: 30 day return with prior notification

Philip Roy, Inc.
Box 68
Indian Rock Beach, FL 33535

models: Apple/TRS-80

emphasis: basic skills
guarantee: not indicated

Quality Educational Micro
168 Express Dr. South
Brentwood, NY 11717

models: Apple/TRS-80/PET

emphasis: general K-12
guarantee: 15 day return for programs over $30

Random House School Division
400 Hahn Road
Westminster, MD 21157

models: Apple/TRS-80

emphasis: basic skills
guarantee: 30 day return
toll call: (800) 241-6402

Scholastic Microcomputer
904 Sylvan Ave.
Englewood Cliffs, NJ 07632

models: Apple/TRS-80/PET
Atari/Texas Instr.

emphasis: general K-12
evaluations on some programs
listings: over 200 programs
guarantee: 30 day return

Sunburst
39 Washington Ave.
Pleasantville, NY 10570

models: Apple/TRS-80/PET
emphasis: general K-12
guarantee: not indicated

APPENDIX B

Magazines/Journals/Newsletters - Software Evaluation & Reviews

Classroom Computer News
51 Spring St.
Watertown, MA 02172
annual rate - $16

This journal is produced bi-monthly. It is directed to the educator by providing assistance in software and hardware selection.

The Computing Teacher
Oregon Council for Computer Education
Eastern Oregon State College
LaGrande, OR 97850
rate - $15 (for 9 issues)

Directed towards elementary and secondary teachers who are just becoming familiar with CAI. Articles will cover instructional application of CAI at all grade levels. (highly recommended)

Creative Computing
Box 789-M
Morristown, NJ 07960
annual rate - $20

Intended for the computer novice. It is not specifically directed at teachers, but can be considered a general interest magazine with good coverage of educational issues related to CAI.

Materials Review & Evaluation Center
Division of Educational Media
State Department of Public Instruction
Raleigh, NC 27611
(919) 733-3929
(no charge for reviews)
approximately 2 issues per year

Software is evaluated by computer consultants in the Department of Education. Three issues have been produced to date containing courseware reviews and evaluations. No fee is required to be placed on their mailing list. (highly recommended)

Purser's Magazine
P. O. Box 466
El Dorado, CA 95623
rate - $4 per issue
- $12 for 4 issues

Provides software evaluation and reviews in addition to well written articles.

Microcomputers In Education
5 Chapel Hill Drive
Fairfield, CT 06432
(203) 37206761
annual rate - $15 for 12 issues
also available - The Best of MIE,
Vol. I, II, and III for $16

Reviews of courseware are often provided by teachers. Articles are interesting and helpful to educators in dealing with computer-related problems - also, evaluations of hardware, books, magazines, and other publications. (highly recommended)

Courseware Report Card
150 West Carob St.
Compton, CA 90220
(213) 637-2131

The Courseware Report Card may provide the most thorough evaluations of educational software. Programs are reviewed for the Apple, TRS-80, PET and Atari microcomputers. Their format is clear. The evaluation section which include comments related to: performance, ease of use, error handling, appropriateness, documentation available for the instructor, and general educational value.

The only problem with this series is the cost. Courseware Report Card/Elementary K-6 and Courseware Report Card/Secondary 7-adult each cost $50. Over a one-year period you are guaranteed 100 reviews for K-6 or 7-adult.

The Journal of Courseware Review
Box 28426
San Jose, CA 95159

Cited in Microcomputers in Education as one of the best collections of reviews directed to educational software. Their first publication, Vol. 1, No. 1, contained 16 reviews for software compatible with the Apple computer - some application to the PET and TRS-80. The subscription rate is $7.

APPENDIX C

Resource Centers

Computer Resource Center
8 Eliot Street
Cambridge, MA 02138
(617) 547-3890

This center, managed by the Technical Education Research Center, has available both hardware and software for evaluation. The center can provide technical assistance and it maintains instructional curricula.

Dataspan
University of Michigan
109 E. Madison Street
Ann Arbor, MI 48104

Information related to science education via CAI can be obtained from this center.

Education Service Center - Region 20
1314 Hines Ave.
San Antonio, Texas 78208
(512) 224-0736

Computer hardware and software will be available for demonstrations at this site. An effort is being made to collect a series of educational courseware which can assist educators in identifying quality software.

Microcomputer Center - SOFTSWAP
Office of Education, Educational Resource Library
San Mateo County
Redwood City, CA 94063

Public Domain materials are collected; educators are permitted to swap materials. Over 200 programs, edited and evaluated, are maintained at this site. Materials may be ordered through direct-mail.

Microcomputer Resource Center - Columbia University
525 West 120th St.
New York, NY 10027
(212) 678-3740

Educators will find most of the popular microcomputers used in education available at this center. A collection of software, books, journals, and periodicals is stored.

Microcomputer Resource Center - SUNY
217 Baldy Hall
Buffalo, NY 14260
(716) 636-2110

Educational Software, in addition to other computer courseware, will be available for evaluation. An array of materials which may be helpful to teachers will be available at this center.

MICROSOFT
Northwest Regional Educational Laboratory
710 S. W. Second Avenue
Portland, OR 97204

Serving as a clearinghouse for educational software, evaluations of courseware designed for instructional programs are available.

Professional Information Center (PIC)
Southeast Metropolitan Board of Cooperative Services
3301 S. Monaco Parkway
Denver, CO 80222

PIC provides assistance to teachers and administrators in identifying courseware to address their specific needs. They are in the process of collecting data indicating the reaction of educators to software which has been integrated into the instructional curriculum.

Trace Center - University of Wisconsin
Research and Development for the Handicapped
314 Waisman
Madison, WI 53706

Materials formerly maintained at the Apple Comptuer Clearinghouse for the Handicapped have been transferred to this center. Educators will find assistance in identifying specially designed hardware and software to meet the needs of handicapped learners. Public domain materials may be available at this center. Educators can submit their names on a mailing list in order to receive current information related to products and materials in this field.

APPENDIX D

MICROCOMPUTER:
USED IN EDUCATIONAL SETTINGS

Apple Computer Inc.
10260 Bandley Dr.
Cupertino, CA 95014

Atari, Inc.
Customer Service
1340 Bordeaux Avenue
Sunnyvale, CA 94086

Commodore Pet
901 California Avenue
Santa Clara, CA 94611

Compucolor Corporation
Intercolor Drive Technology Park
Atlanta-Norcross, GA 30092
404-449-5996

Monroe Systems for Business
The American Road
Morris Plains, NJ 07950
Attn: Monroe Education Center

Ohio Scientific
1333 South Chillicothe Road
Aurora, OH 44202
216-831-5600

Osborne Computer Corporation
16500 Corporate Avenue
Hayward, CA 94545

Radio Shack
1300 One Tandy Center
Fort Worth, TX 76102

Sinclair Research Ltd.
475 Main Street
Box 3027
Wallingford, CT 06492

Soroc Technology Inc.
169 Freedom Avenue
Anaheim, CA 92801
800-854-0147

Texas Instrument Inc.
Consumer Relations
P.O. Box 53
Lubbock, TX 79408

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Barden, William. How to Buy and Use Minicomputers and Microcomputers, Indianapolis, IN: Howard W. Sams & Co., Inc., 1977.

Douglas, Sairley and Gary Neights. A Guide to Microcomputers: A Cooperative Project by the Pennsylvania Department of Education and Colonial Northampton Intermediate Unit. Nazareth, PA: Colonial Northampton Intermediate Unit, 1980.

Frederick, Franz. Today's Education, "Inside Microcomputers" April-May, 1982.

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Joiner, Lee et al. Microcomputers in Education, Holmes Beach, FL: Learning Publications, 1982.

Leventhal, Lance. Why Do You Need a Personal Computer, New York, NY: John Wiley & Sons, Inc., 1981.

Moursund, David. Introduction to Computers in Education for Elementary and Middle School Teachers, University of Oregon, OR: 1982.

Walter, Russell. Secret Guide to Computers, Elmwood, CT: Computer Consulting Inc., 1980.

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Papert, Seymour. Mindstorms: Children, Computers, and Powerful Ideas, New York, NY: Basic Books Publishing Co., 1980.

Poirot, James. Computer and Education, Austin, TX: Sterling Swift Publishing Co., 1980.